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(71) Applicant Midland-Ross Corporation, 20600 Chagrin Boulevard, Shaker Heights, Cleveland, Ohio 44122, United States of America
(72) Inventor Alex Jakob Schregenberger
(74) Agent D. Young & Co.

(54) An Apparatus Used in the Treatment of Cans

(57) An apparatus for the treatment of cans 11 is made up of a number of individual units, each of which essentially comprises a pair of drums 21, 22 that are mounted for rotation about parallel vertical axes. One of the drums is used for treatment of the interior of the cans, while the other is utilized for treatment of the exterior of the cans, both treatments being for example, spraying using nozzle systems (50), Fig. 3 (not shown). Each of the rotary drums is provided with suction or magnetic means for holding a number of cans 11 in circumferential alignment around the outer periphery 24 such that the longitudinal axes of the cans are radially oriented relative to the rotational axes of the drums. Air jets 55 are provided to successively transfer the cans from one drum to another. A number of such units can be used, in tandem, to treat the cans beginning with washing, rinsing and drying of the cans to heating, coating and drying of the coated cans, Fig. 7 (not shown). The containers may alternatively be held with their axes vertical or at an angle to the vertical, Figs. 8, 9 (not shown).

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

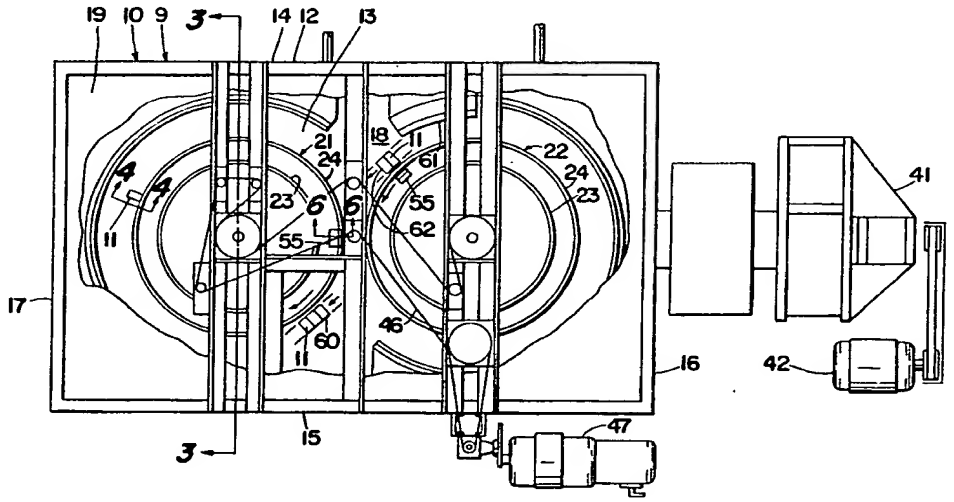

Fig. 1

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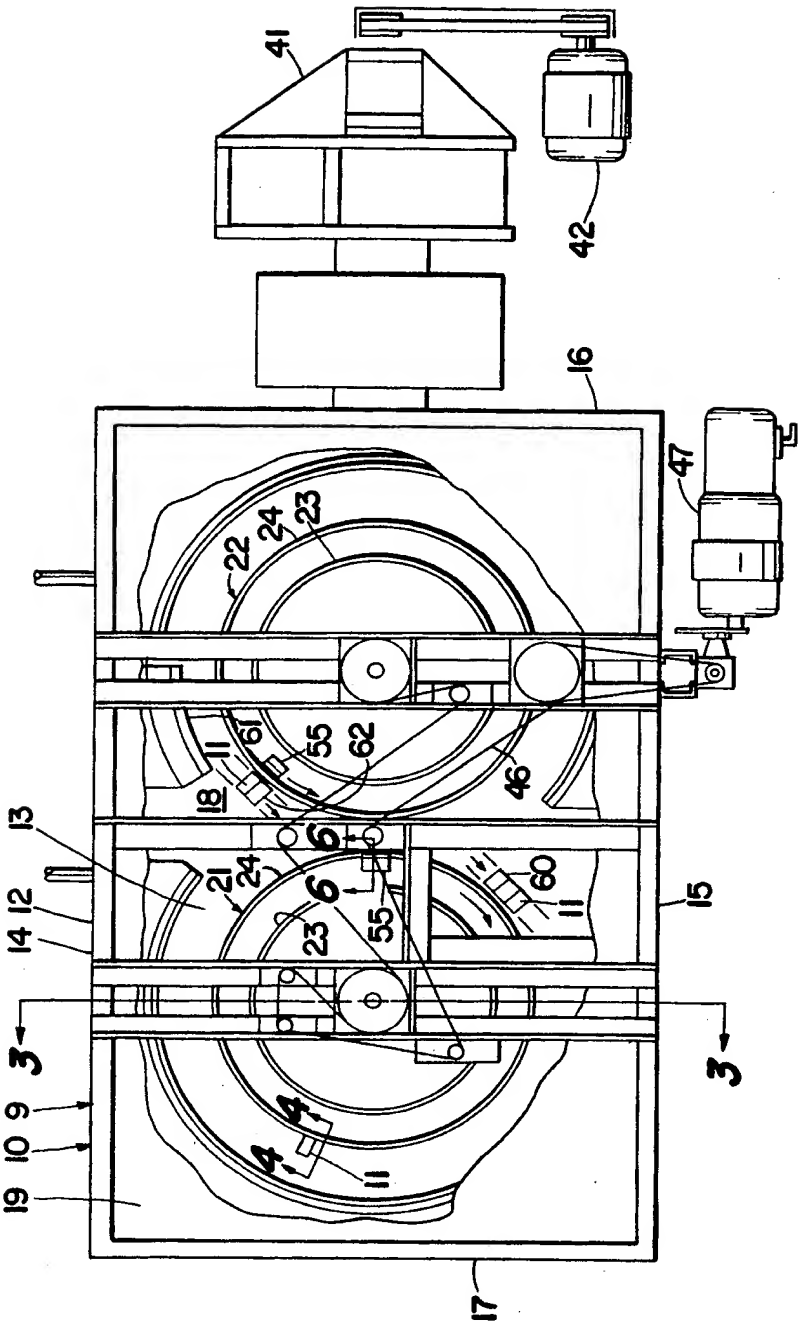

Fig. 1

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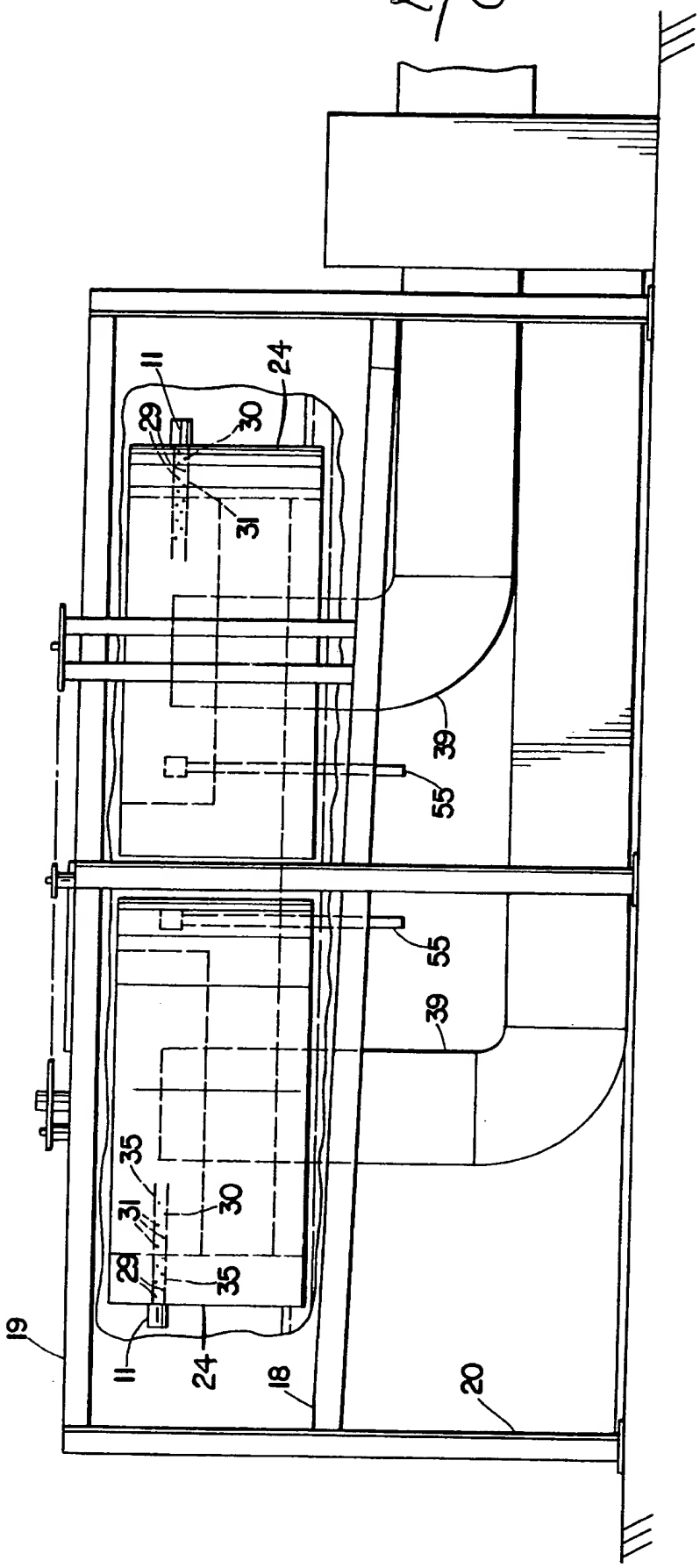

Fig. 2

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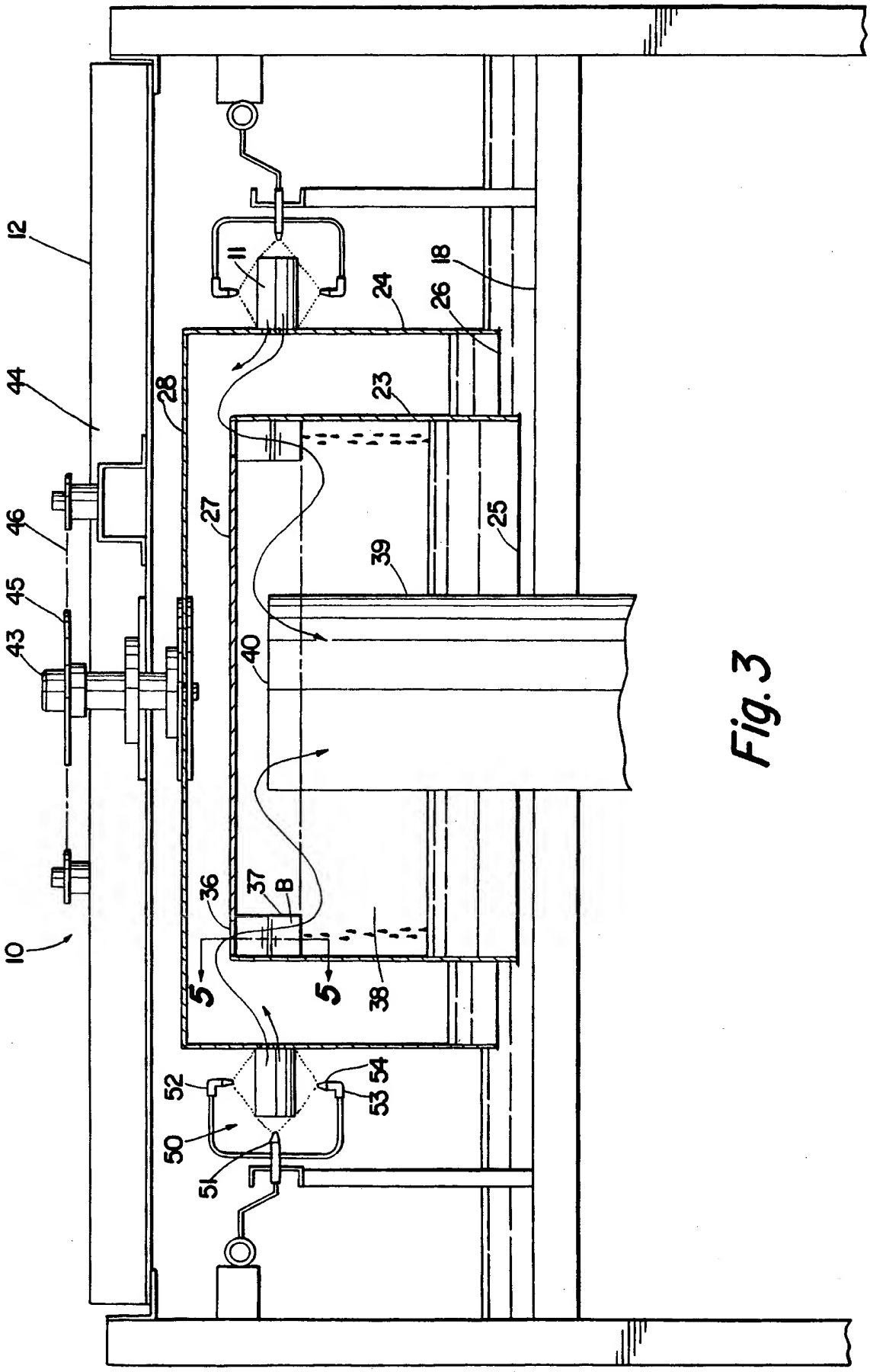

Fig. 3

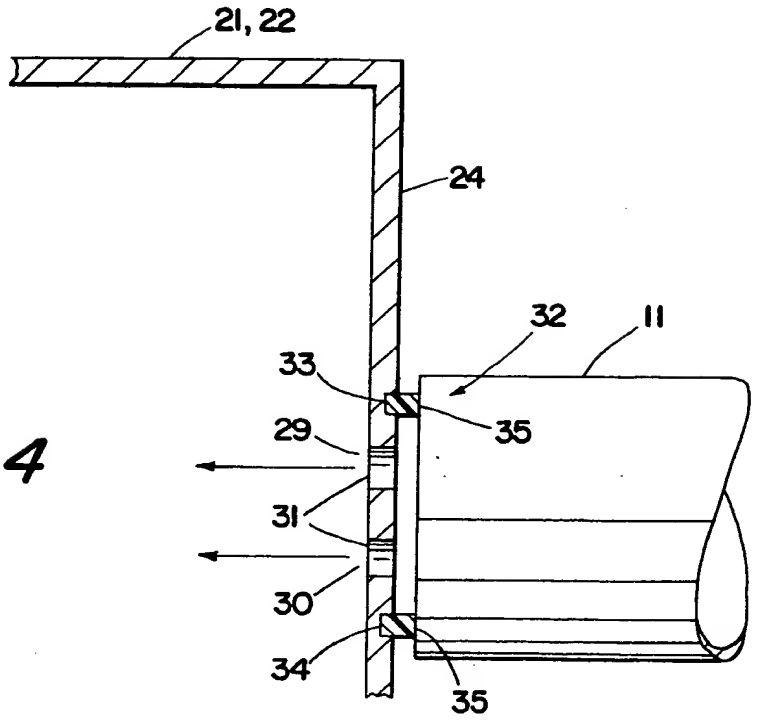

Fig. 4

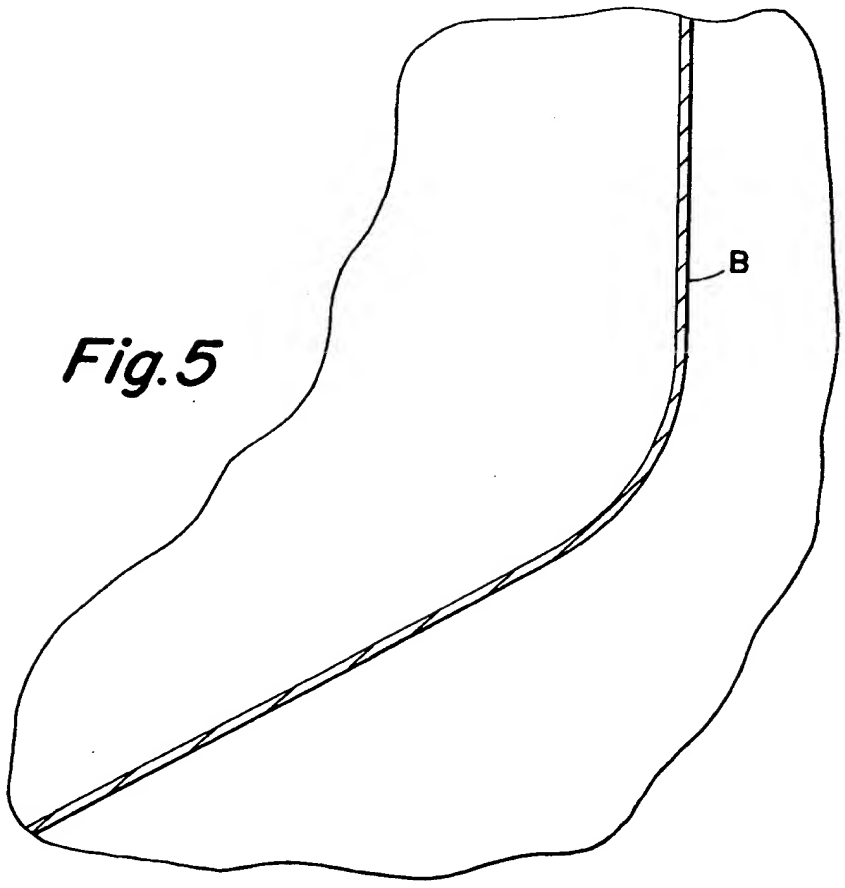

Fig. 5

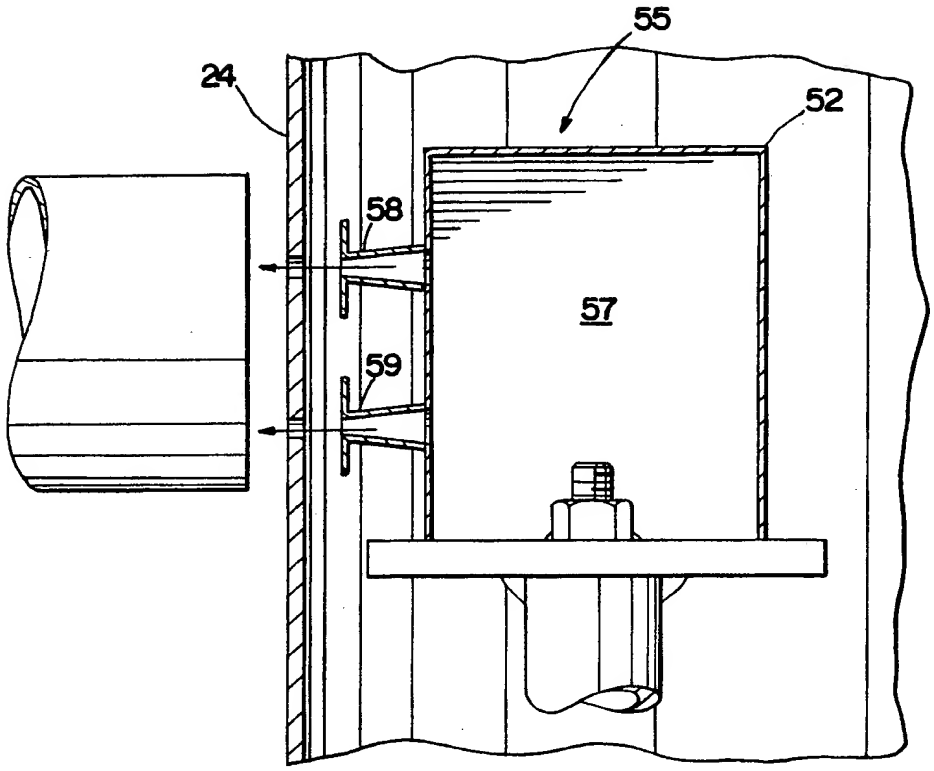

Fig. 6

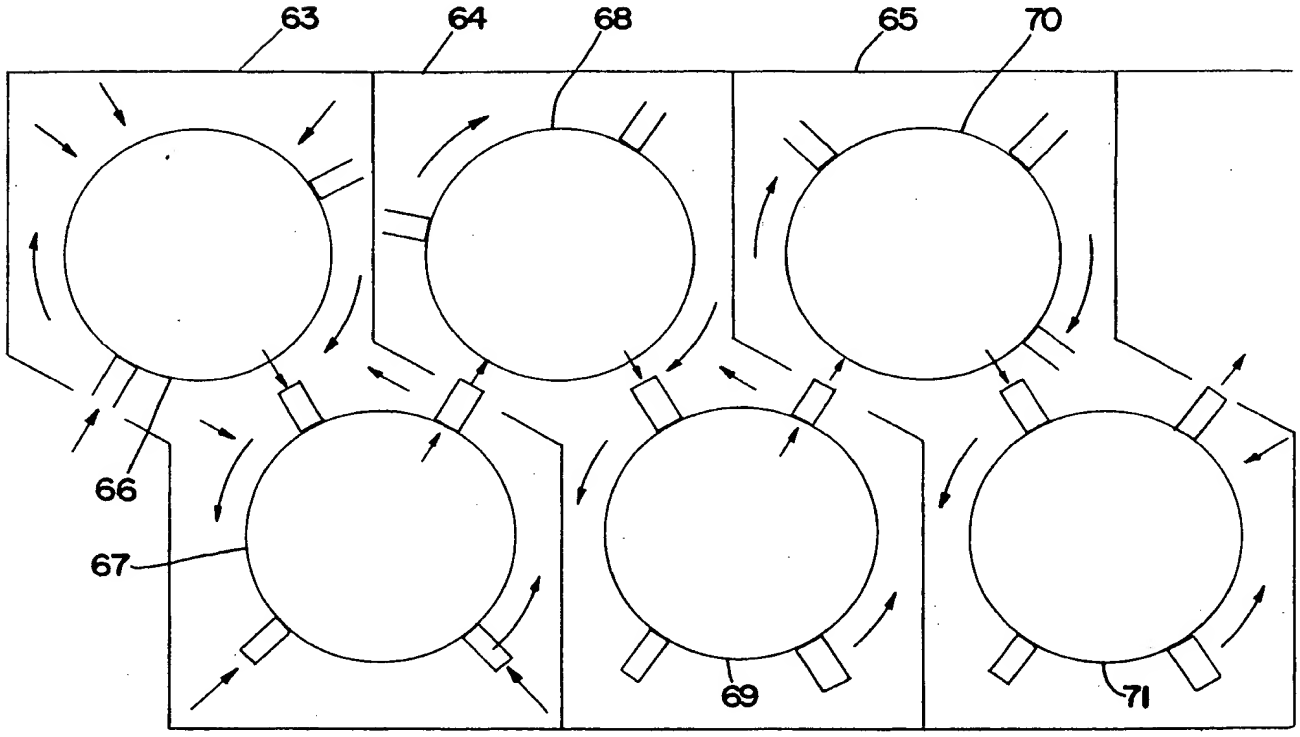

Fig. 7

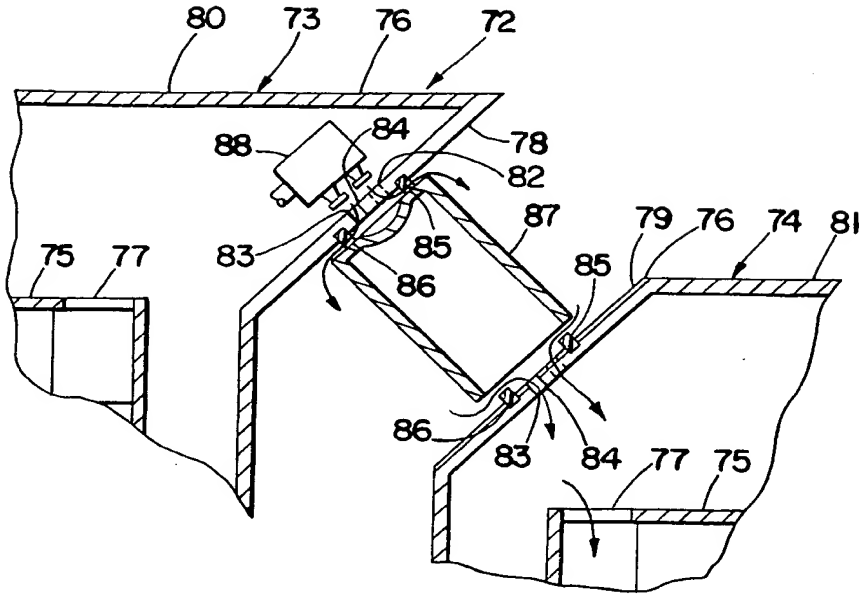

Fig. 8

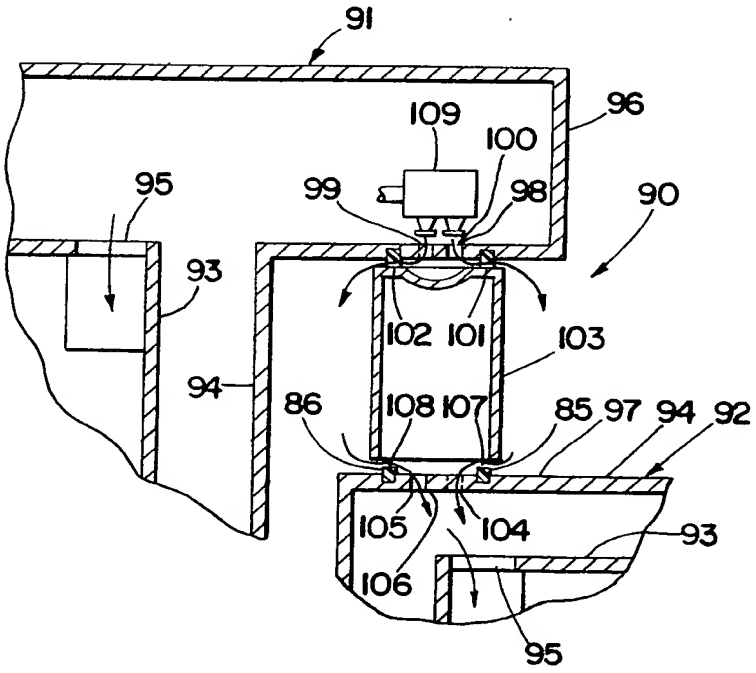

Fig. 9

SPECIFICATION

An Apparatus Used in the Treatment of Cans

This invention relates to apparatus for the treatment of cans. Such cans may have opposing ends, one of which is open and the other of which is closed. The apparatus is especially useful in the washing, rinsing and drying of such cans.

U.S. Patents Nos. 797 298 and 3 952 698 are typical of the many patents relating to apparatus which includes conveyors for supporting a number of cans as they are being treated. Such machines are generally bulky and are confronted with the problem that occasionally cans topple over and become disoriented on the conveyor resulting in non-uniform treatment of the cans.

U.S. Patents Nos. 3 302 655 and 3 861 409 are directed to apparatus which employs mechanisms for rotating the cans about a horizontal axis, or in a vertical plane for treatment. It can be appreciated that liquid, used in the washing and rinsing of cans in such apparatus, will remain in a can until the can passes through an upside-down position in the cycle of rotation. This is not the most desirable situation. It would be beneficial if there was available a different type of can treating apparatus in which the aforementioned problems are eliminated or substantially reduced.

The present invention provides an apparatus for treating cans or like containers having one closed and one open end, characterised by the combination of:—

(a) a pair of rotatable members, spaced from one another and rotatable about parallel axes,

(b) holding means for temporarily holding the containers onto one or other of the members so that the containers can be moved in a circular path past treatment means by rotation of the respective member, and

(c) means for successively transferring the containers from an outer curved surface of one member to a like surface of the other member, the apparatus being such that the interior of the containers can be treated while they are being held by one of the members and the exterior can be treated while they are being held by the other of the members.

There is particularly disclosed and illustrated herein an apparatus which is used in the treatment of hollow cylindrical containers or cans having a pair of opposing ends, one of which is open and the other of which is closed. It comprises at least one pair of cylindrical drums which are rotatable about vertically disposed, parallel axes. Means are provided for holding a number of cans, successively brought to one of the pair of cylindrical drums, adjacent the outer periphery in circumferential spaced horizontal alignment and in radially oriented relation to the rotational axes of the drums. Means are supplied for successively transferring the radially oriented containers from one drum to the other, when the containers on the one drum are rotated to a predetermined position adjacent the other drum. Means disposed exteriorly of each of the drums, are utilized for contacting the cans with fluid, under pressure, used in the treatment of the cans.

While the term "can" is used in this Specification, it will be understood that the invention is applicable to the treatment of any similar container, and the word "can" is therefore to be given a broad interpretation.

The invention will be better understood by having reference to the accompanying drawing, wherein:—

Figure 1 is a plan view of one example of an apparatus made in accordance with the invention with certain top portions removed for clarity;

Figure 2 is a side view of the apparatus with certain portions removed to more clearly show the invention;

Figure 3 is a section of the apparatus, as viewed from the line 3—3 of Figure 1;

Figure 4 is a section viewed from the line 4—4 of Figure 1;

Figure 5 is a section viewed from the line 5—5 of Figure 3;

Figure 6 is a section viewed from the line 6—6 of Figure 1;

Figure 7 is a schematic plan view of an apparatus used in the cleaning and coating of a can;

Figure 8 is a partial sectional view of another embodiment of the invention; and

Figure 9 is a partial sectional view of a third embodiment of the invention.

With reference to Figures 1—3, there is shown the basic unit 9 of an apparatus 10 used in the treatment of hollow cylindrical metal containers or cans 11 having a pair of opposing ends, one of which is open and the other of which is closed. This basic unit 9 can be combined with any number of similar units to provide, for example, a complete apparatus 10 for washing, rinsing, drying and coating such cans 11.

The basic unit 9 of the apparatus 10 essentially comprises a tank 12 having an enclosed chamber 13 which is bounded by a pair of opposing sidewalls 14, 15, a pair of opposing end walls 16, 17, a bottom floor 18, and a top cover 19. The tank 12 is horizontally disposed and supported on a number of similar legs 20, Figure 2. A pair of drums 21, 22 are rotatably mounted in the chamber 13 of the tank 12 for rotation about parallel axes which are vertically disposed.

Each of the drums 21, 22, as best seen in Figure 3, comprises a fixedly disposed hollow inner cylinder 23 which is coincidental with a surrounding outer hollow cylindrical shell 24 that is rotatable about the inner cylinder 23. The inner cylinder 23 and outer shell 24 are rigid and composed of any suitable material, e.g. metal or plastic, and are similar in design in that they both have vertically lowermost bottom ends 25, 26 which are open and spaced from the adjacent bottom floor 18 (Figure 2) of the tank 12, and vertically uppermost closed tops 27, 28 that are vertically spaced from the open bottom ends 25, 26 and each other.

The outer shell 24 has a plurality of rows 29, 30 of similarly sized, circumferentially spaced and aligned orifices 31 (Figure 2) which are in predetermined spaced relation from each other, depending on the size of the cans 11. The orifices 31 of the adjacent rows 29, 30 are vertically staggered circumferentially of the outer shell 24. It should be appreciated that a number of spaced pairs of rows of orifices can be provided where it is desirable to process a greater number of cans 11. Thus, instead of being capable of treating a single, circumferential line of cans 11, each of the drums 21, 22 may be adapted to accommodate a plurality of rows of circumferentially aligned and spaced cans 11, as it is simply a matter of conveying the cans 11 to and from the drums 21, 22 at different levels.

It can be appreciated that there will be two point contact of the open ends of the cans 11 with the rigid outer shell 24 and two point or, at most, single line contact between the closed ends of the cans 11 and adjacent curved outer surface of the shell 24 depending on whether the closed ends contain a recess. With reference to Figure 4, there is shown an arrangement 32 for improving the contact between the cans 11 and each of the outer shells 24 of the drums 21, 22. The arrangement 32 comprises a pair of annular recesses 33, 34 which are disposed parallel to each other circumferentially of the outer shell 24 and are respectively above and below the rows 29, 30 of the orifices 31. A soft, resilient ring 35 of any suitable material not adversely effected by the liquid used in the treatment of the cans 11, is disposed in each of the recesses 33, 34 and protrudes therefrom to engage the cans 11 and provide four point contact with the open and closed ends of the cans 11 as they are pressed against the rings 35, rather than the aforementioned limited two point contact.

An annular opening 36, as best seen in Figure 3, is disposed in the closed top 27 of each of the inner cylinders 23 and communicates with an annular fluid passageway 37 which is open to the hollow inside 38 of the inner cylinders 23. A plurality of similar shaped baffles B, as best seen in Figure 5, are arcuately shaped around each of the fluid passageways 37 and are generally radially oriented relative to the axes of the inner cylinders 23. The baffles B are specially configured to separate, using centrifugal force, droplets of water which are carried downwardly through the fluid passageways 37 by air from the orifices 31. A discharge pipe 39 is centrally disposed in each of the inner cylinders 23 and has an open end 40 spaced from the adjacent closed tops 28 of the inner cylinders 23. The discharge pipes 39 are in communication with a blower 41 (Figure 1) which is operatively connected to an electric motor 42. In use, the blower 41 creates a vacuum or suction within the discharge pipes 39 to draw air from the exterior of the drums 21, 22 inwardly through the orifices 31, then downwardly through the fluid passageways 37 where water is separated from the air. The air is then drawn into the discharge pipes 39 for exit to the ambient atmosphere, or reuse in some other component of the apparatus 10 as desired.

The closed tops 29 of the outer shells 24 are each secured to a centrally disposed shaft 43 (Figure 3) which extends upwardly therefrom and is journalled for rotation in reinforcement angle members 44 that span the chamber 13 laterally and are secured to the sidewalls 14, 15 of the tank 12. The shafts 43 of the drums 21, 22 are coupled by any suitable means, e.g. sprocket wheels 45 and chains 46, to an electric motor 47 (Figure 1) which in use rotates the outer shells 24 of the drums 21, 22 in synchronism relation.

Any suitable mechanism 50 can be utilized to direct against the cans 11, liquid used in the treatment of the cans 11, e.g. cleaning liquid to wash and rinse the cans 11. The mechanism 50, in this instance, comprises three sets 51, 52, 53 of similar nozzles 54 (Figure 3) which are fixedly disposed and spaced in aligned relation circumferentially about each of the outer shells 24 adjacent the rows 29, 30 of orifices 31. The first set 51 of nozzles 54 is positioned to direct streams or jets of liquid, under pressure, in radial directions against the cans 11 and outer shells 24. The other two sets 52, 53 of nozzles 54 are positioned in opposed vertically spaced relation from the first set 51 of nozzles 54 and adjacent outer shells 24, to direct opposing jets of liquid, under pressure, towards each other and the cans 11 travelling therebetween due to rotation of the cylinder 24. It will be appreciated that the nozzles 54 can be arranged in any desired pattern, depending on the desired treatment of the cans 11.

With reference to Figures 1 and 6, there is shown a blowoff device 55 used to successively transfer the cans 11 between adjacent pairs of drums, e.g. drums 21, 22. The blowoff device 55, in this instance, is positioned between the inner cylinder 23 and outer shell 24 of the drum 21, first encountered by the cans 11, in a predetermined position relative to the other adjacent drum 22 to direct a stream or jet of air, under pressure, radially outwardly through the orifices 31 of the rows 29, 30 to literally blow the cans 11 successively away from the outer shell 24 of the first-to-encounter drum 21 in the direction of the next-to-encounter drum 22 for pickup thereby adjacent the orifices 31. The blowoff device 55 comprises a housing 56 with an enclosed compartment 57 to which air from any suitable source, e.g. discharge pipes 39, is circulated, under pressure. A pair of nozzles 58, 59 extend from the housing 56 in the direction of the adjacent outer shell 24, the longitudinal axes of the nozzles 58, 59 being coaxially aligned with the circumferential centerlines of the rows 29, 30 of orifices 31 for directing air, under pressure, from the compartment 56 through the adjacent orifices 31 as they pass before the nozzles 58, 59. Similar blowoff devices 55 are also utilized to successively remove cans 11 from the last-to-encounter drums of the apparatus 10.

In operation, metal cans 11 are brought by any suitable conveyor 60 (Figure 1) in properly radially oriented fashion to adjacent the first-to-encounter drum 21 for pickup and processing e.g. washing. Prior to this, the apparatus 10 has been made operational by circulating liquid, used in the washing of the cans 11, to the chamber 13 to fill the tank 12 to a level where the liquid is slightly higher than the open bottom ends 25, 26 of the inner cylinder 23 and outer shell 24 to seal the bottom ends 25, 26 and prevent the escape of air from within the inner cylinder 23 and outer shell 24. The cans 11 are preferably brought to the first-to-encounter drum 21 in such a way that the closed ends of the cans 11 are adjacent the outer shell 24 for pickup adjacent the orifices 31 by suction created thereat by the blower 41. By rotation of the shell 24, the cans 11 are moved between and adjacent the first three sets 51—53 of nozzles 54 which are used to spray and wash the inside of the cans 11 with washing liquid, after which the cans 11 move to a position adjacent the second drum 22, whereat the blow-off device 55 blows each of the cans 11 successively toward the second drum 22 for suction pickup thereby. This time the open ends of the cans are adjacent the outer shell 24. Against, the cans 11 are moved between and adjacent the second three sets 51—53 of nozzles 54 which are used to spray and wash the outside of the cans 11 with washing liquid. The cans 11, in this instance, are then moved into juxtaposition with a larger conventional blowoff nozzle 61 which directs air, under pressure, against the cans 11 to remove excess liquid used in the washing of the cans 11. Shortly thereafter the cans 11 are removed from the second drum 22 by a similar blowoff device 55 to the next succeeding drum or to an adjacent conveyor 62 for removal from the apparatus 10.

With reference to Figure 7, there is shown a portion of an apparatus 10 which is comprised of a plurality of treatment stages of, for example, adjacently disposed units 63—65, each of which units comprises a pair of rotary drums similar to the drums 21 described above. In this case, the cans 11 are successively charged to the first-to-encounter drum 66 of the first unit 63 where, for example, the inside of the cans are washed with any suitable liquid, after which the cans 11 are transferred by a blowoff device 55 to the last-to-encounter drum 67 of the first unit 63 where the outside of the cans are similarly washed.

The cans 11 are then successively transferred by a blowoff device 55 to the first-to-encounter drum 68 of the second unit 64, where, for example, the insides of the cans 11 are rinsed with any appropriate liquid, after which the cans 11 are similarly transferred to the last-to-encounter drum 69 of the second unit 64 where the outside of the cans 11 are rinsed.

The cans 11 are then successively transferred to the first-to-encounter drum 70 of the third unit 65 where, for example, the inside of the cans are chemically etched by any suitable etching solution, after which the cans 11 are transferred to the last-to-encounter drum 71 of the third unit 65 where the outside of the cans 11 are likewise etched. The cans 11 are transferred to any number of successive units (not shown) where they are further treated, for example, by rinsing, coating, etcetera. It can be appreciated that any number of basic units can be provided, depending on the desired treatment of the cans 11. Each unit or stage of the process, is accomplished by the use of two rotating drums where the inside and outside of the cans held, thereagainst, are similarly treated. It should be appreciated that a single unit can perform a number of different processes, providing the tank is drained and refilled as necessary with any new liquid used in the treatment of the cans in a particular stage or cycle.

With reference to Figure 8, there is shown another basic unit 72 which is essentially the same as the basic unit 9 of the apparatus 10 of Figures 1—6, except for the configuration of the outer shells of the rotary drums and the corresponding positioning of the cans relative thereto. The basic unit 72 is also comprised of a pair of adjacently disposed drums 73, 74 which are rotatable about parallel, vertical axes and which include similar fixed inner cylinders 75 that are surrounded by hollow outer shells 76 which are mounted for rotation about the inner cylinders 75. The inner cylinders 75 are provided with similar annular openings 77 with baffles through which the mixtures of liquid and air enters the inner cylinders 75 and are separated as previously described.

The outer shells 76 of the drums 73, 74 are provided with matingly configured inverted and upright frustoconical portions 78, 79 adjacent their closed tops 80, 81, respectively. The frusto-conical portions 78, 79 of the drums 73, 74 are each provided with a plurality of circumferentially oriented rows 82, 83 of spaced, similarly sized orifices 84 which are generally vertically staggered between a pair of parallel, resilient rings 85, 86, against which the cans, e.g. can 87, rest as they rotate with the drums 73, 74. Similar blowoff devices 88, are positioned to successively transfer the cans 87 from the inverted frusto-conical portion 78 of the first-to-encounter drum 73 to the upright frusto-conical portion 79 of the last-to-encounter drum 74 and to transfer the cans 87 from the last-to-encounter drum 74 onto a conveyor for removal or to another basic unit used in the further treatment of the cans.

With reference to Figure 9, there is shown still another basic unit 90 which is essentially the same as the other basic units 9, 72 except again, for the shape of the outer shells of the rotary drums and the corresponding locations of the cans relative thereto. The basic unit 90 is also comprised of a pair of rotary drums 91, 92, each of which similarly includes a fixed cylinder 93 and a rotary outer shell 94. The inner cylinders 93 are each likewise provided with an annular opening 95 with baffles through which air enters the inner

cylinders 93 as previously described. The outer shell 94 of the first-toencounter drum 91 is generally cylindrical except for a hollow annular, cantilevered portion 96 which is spaced from, and overhangs an adjacent portion of the closed top 97 of the hollow cylindrical shell 94 of the other, last-to-encounter drum 92. The cantilevered portion 96 of the first drum 91 is provided with a plurality of spaced circular rows 98, 99 of spaced, similarly sized orifices 100 which are again located in staggered relation between a pair of parallel circular resilient rings 101, 102, which face, at the point of transfer of the cans, e.g. can 103, similar vertically aligned components of rows 104, 105 of orifices 106 and resilient rings 107, 108 located in the adjacent, vertically lower closed top 97 of the second drum 92 and against which the cans rest as they rotate successively with the two rotary drums 91, 92. Similar blowoff devices 109 are also used for the purposes previously described.

It can be appreciated from a comparison of the basic units 9, 72, 90 of the drawing, that in all units, the cans are held against outer surfaces of rotary drums in positions where the cans are moved in a circular path as the drums rotate about vertical axes. In the units 9, 72, the longitudinal axes of the cans are angularly disposed to the vertical axes. The cans in the embodiment of Figures 1—6 are radially oriented being held in a general horizontal position or with their axes at an angle of 90° to the rotary axes, whereas the cans in the embodiment of Figures 8 and 9 are maintained tilted downward in positions where the open ends of the cans face downwardly (vertically in Figure 9, and at about 45° to the vertical in Figure 8) so that any liquid entering the cans during the course of their treatment will always flow, by gravity, therefrom, so that no liquid will be retained within the cans, so preventing any deleterious effect of liquid upon them.

The foregoing description has referred to the use of suction as a means for holding the cans in properly oriented relation adjacent the rotary drums, e.g. drums 21, 22. In some instances, magnetic forces can be advantageously used to attract and hold cans adjacent to the outer peripheries of the rotating drums 21, 22, rather than suction created at orifices 31. This is best accomplished by the provision of a strong magnetic field circumferentially around the inner periphery of the outer shells of the drums 21, 22. The cans can be transferred between adjacent drums by selectively controlling the magnetic field in the transfer area of the cans with or without the aid of a blowoff device as previously described. The magnetic field can be created by any suitable permanent magnetic or electromagnetic devices which are, preferably, stationary and adjacent the inner peripheries of the outer shells 24. An apparatus can be provided with alternative systems using magnetism and suction, if desired, or with a combination of the two. The use of magnetism has certain advantages over suction. For example, the costly blowers and necessary ductwork, as well as the blowoff devices, can be eliminated when magnetism is used to maintain the cans adjacent the drums. Magnetism would of course be unworkable with non-metallic cans or cans not affected by magnetism.

There has been particularly described herein a unique apparatus that can be used in the treatment of hollow cylindrical metal cans having opposed open and closed ends. The apparatus comprises at least two drums which are rotatable about parallel, vertical axes and are designed to rotate the cans in a horizontal plane about a vertical axis.

Claims

1. An apparatus for treating cans or like containers having one closed and one open end, characterised by the combination of:—

(a) a pair of rotatable members, spaced from one another and rotatable about parallel axes,

(b) holding means for temporarily holding the containers onto one or other of the members so that the containers can be moved in a circular path past treatment means by rotation of the respective member, and

(c) means for successively transferring the containers from an outer curved surface of one member to a like surface of the other member, the apparatus being such that the interior of the containers can be treated while they are being held by one of the members and the exterior can be treated while they are being held by the other of the members.

2. The apparatus of claim 1, wherein the container holding means is such that the containers are held with their longitudinal axes substantially parallel to the rotational axis of the member against which the containers are held.

3. The apparatus of claim 1 or 2, wherein the rotatable members are formed by a pair of drums rotatable about respective first and second axes, and each drum has at least one row of orifices circumferentially spaced around each of the drums; and in that the holding means is arranged for drawing air exteriorly of the drums radially inwardly through the orifices into the interior of the drums.

4. The apparatus of claim 3, wherein the means for successively transferring the containers includes air supply means for directing air, under pressure, radially outwardly through at least one of the orifices of the drum in order to detach the container from the drum when the container is in position to be picked up by the other drum.

5. The apparatus of claim 3, 4, or 5 which includes a plurality of rows of circumferentially spaced and horizontally aligned orifices, the orifices of adjacent rows being staggered vertically around the drums and the drum axes being substantially vertical.

6. The apparatus of claim 3, 4 or 5 which includes a pair of annular recesses disposed circumferentially of each of the drums and sandwiching a pair of adjacent rows of orifices

therebetween, and a resilient elastomeric ring disposed in each of the recesses and protruding therefrom for engaging containers.

7. The apparatus of claim 3 or any claim dependent thereon, wherein the treatment means includes a first series of nozzles arcuately spaced at least partially around each of the drums and radially spaced from the peripheries thereof, for directing fluid, under pressure, towards the associated drum in a radial direction, a second series of nozzles respectively adjacent the nozzles of the first series, for directing fluid, under pressure, vertically downwardly against the containers held adjacent each of the drums, and a third series of nozzles respectively adjacent the nozzles of the first series, for directing fluid, under pressure, vertically upwardly against the containers held adjacent each of the drums.

8. The apparatus of any preceding claim in which the said axes are vertical, in which a first one of the rotatable members can rotate the containers about a first one of the axes in a horizontal pathway from a first position to an arcuately spaced second position, in which the transferring means operates to transfer the containers from the second position to a third position which is substantially opposite the second position, in which the containers are moved by the second rotatable member about the second axis in a horizontal pathway from the third position to an arcuately spaced fourth position, in which the apparatus includes means for removing the containers from the fourth position, and in which the treatment means in use applies fluid, under pressure, to the containers while the containers travel between the first and second positions and the third and fourth positions.

9. The apparatus of claim 3 or any claim dependent thereon, which includes baffle means disposed interiorly of each of the drums for separating any liquid from air drawn inwardly through the orifices.

10. The apparatus of claim 3 or any claim dependent thereon, which includes a plurality of pairs of similar drums positioned in staggered relation, means for carrying a number of containers successive to a position adjacent the drum first to be encountered by the containers for transfer thereto, and means for successively removing the containers from the drum last to be encountered by the containers.

11. An apparatus according to any preceding claim comprising a tank having at least one chamber with a bottom floor therein; and wherein the holding means includes means for drawing air from exteriorly of the drums, inwardly through the orifices and interiorly of the drums.

12. Apparatus according to claim 8 in which the removing means operates for blowing-off containers held adjacent the orifices, and includes means fixedly disposed relative to at least one of the rotatable drums, for directing air, under pressure, radially outwardly through the orifices in th direction of the other drum adjacent ther to, when the orifices of the one drum pass before the blow-off means.

13. The apparatus of claim 3 or any claim dependent thereon, wherein each drum includes: a hollow, inner cylinder fixedly disposed interiorly of a hollow cylindrical outer shell which is rotatable about the inner cylinder, the inner cylinder and outer shell each having an open bottom spaced from the bottom floor of the chamber and a closed top spaced from an adjacent top of the tank; the apparatus further including:

I a discharge pipe centrally disposed vertically within each of the inner cylinders and having an open end spaced from the closed end of an adjacent inner cylinder;

II an annular opening disposed in the closed top of each of the inner cylinders in radially spaced relation from the open end of the discharge pipe;

III an annular fluid passageway communicating with each of the annular openings and extending downwardly therefrom interiorly of the inner cylinders, each of the fluid passageways including a plurality of arcuately spaced baffles which are radially oriented relative to the longitudinal axes of the inner cylinders and which are configured to separate by centrifugal force, liquid in the air as the air flows downwardly between the baffles into the spaces between the discharge pipes and inner cylinders; and

IV means coacting with the discharge pipes for drawing air through the discharge pipes in directions away from the closed tops of the inner cylinders.

14. The apparatus of claim 13, which includes means for circulating liquid, used in the treatment of the containers, into the chamber to a level where the liquid is vertically above the bottom open ends of the inner cylinders and outer shells.

15. The apparatus of claim 14 which includes a plurality of similar tanks disposed, in tandem, each of the tanks including a similar pair of drums for treating the insides and outsides of the containers.

16. The apparatus of any preceding claim, wherein the container holding means includes means for magnetically holding the containers in position.

17. The apparatus of claim 16, which includes means for selectively controlling the magnetic field in areas where containers are transferred between drums.

18. The apparatus of any preceding claim, wherein the container holding means is such that the containers are held with their longitudinal axes disposed at an acute angle to the rotational axis of the rotatable member against which the containers are held.

19. The apparatus of any preceding claim, wherein the container holding means is such that the containers are held with their longitudinal axes normal to the rotational axis of the rotatable member holding the containers.

20. A method of treating containers having a pair of opposing ends, one of which is open and

the other of which is closed, comprising:

(a) bringing a number of containers successively to a first position where the longitudinal axis of each container is angularly oriented relative to a first vertical axis and one end of the container is closer to the first vertical axis than the other end;

(b) rotating each container from the first position through a predetermined arc about the first vertical axis to a second position while contacting the container with liquid used in the treatment of the container; and

(c) successively transferring each container in the second position to a third position where they are carried by a second member rotatable about a second vertical axis and the said other end of the container is closer to the second member than the said one end;

(d) rotating each container from the third position through a predetermined arc about the second vertical axis to a fourth position while contacting the container with liquid used in the treatment of the container; and

(e) removing the containers successively from the fourth position.

21. The method of claim 20, wherein the closed end of each container in the first position is closer than first vertical axis than the open end of the container, so that the inside of the container is treated first.

22. The method of claim 20 or 21, which includes cleaning the containers by successively washing, rinsing and at least partially drying the containers as they rotate in radially oriented relation about a plurality of vertically disposed, parallel axes.

23. The method of claim 20, 21 or 22, which includes detachably mounting the containers adjacent orifices circumferentially disposed in horizontal alignment in the outer peripheries of cylindrical drums which are rotatable about the vertical axes.

24. The method of claim 23, which includes creating suction of air radially inwardly of the drums at the orifices to hold the containers adjacent thereto until they reach the second and fourth positions where they are blown off the drum against which they are held.

25. The method of any one of claims 20—24 which includes magnetically holding the cans relative to the axes while rotating them.

26. An apparatus for treating cans or like containers substantially as herein particularly described with reference to and as illustrated in the accompanying drawings.

27. A method for treating cans or like containers substantially as herein particularly described with reference to and as illustrated in the accompanying drawings.

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